

Patent
IBM Docket No. FIS919980039US3

In the claims:

Claims 1 - 75 (Canceled)

76. (Amended) A method of forming a land grid assembly (LGA) module, said method comprising:

preparing a cap including sealing legs respectively extending from peripheral ends of a first surface of said cap, and at least one integrally formed protrusion on said first surface of said cap intermediate said sealing legs; and

joining a substrate to said sealing legs to form a sealed module, said at least one protrusion extending to a predetermined distance above a surface of the substrate when the module is sealed,

wherein a position of said at least one protrusion is selectively adjustable in relation to said substrate and

wherein during a load condition on said substrate, said at least one protrusion suppresses an amount of flexing of said substrate.

77. (Original) The method according to claim 76, wherein said cap is for mechanically protecting a chip mounted on said substrate, and for providing a heat transfer path from a back side of the chip to an external cooling environment.

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78. (Original) The method according to claim 76, wherein said at least one protrusion is a predetermined distance from an opposing surface of said substrate during an unloaded state of said module, said predetermined distance being substantially within a range of about 0.000 inches to about 0.003 inches above the substrate surface.

79. (Original) The method according to claim 76, wherein said at least one protrusion is formed on a same plane as a bottom surface of said cap.

80. (Original) The method according to claim 76, wherein said at least one protrusion extends not completely to a surface of the substrate opposing said at least one protrusion.

81. (Original) The method according to claim 76, wherein said at least one protrusion is preloaded against said substrate.

82. (Original) The method according to claim 76, wherein said at least one protrusion is gimbaled or otherwise includes a movable contact surface which self-registers against the substrate or an opposite contact surface.

83. (Original) The method according to claim 76, further comprising capping the at least one protrusion with an elastomer layer.

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84. (Original) The method according to claim 76, further comprising mounting an elastomer member in an area of said substrate corresponding to said at least one protrusion when the cap is joined to said substrate.

85. (Original) The method according to claim 76, wherein said at least one protrusion includes one of a rounded surface and a spherical contact surfaced for centered contact.

86. (Original) The method according to claim 76, wherein the at least one protrusion is located substantially within a range of about $\frac{1}{3}$ to about $\frac{1}{4}$ the diagonal distance from a center to a corner of the substrate.

87. (Original) The method according to claim 76, wherein said at least one protrusion is located substantially near the center of said substrate.

88. (Original) The method according to claim 76, wherein a bottom surface of said at least one protrusion is substantially on a same plane as an interface between the bottom surface of the sealing legs of the cap and such that a clearance of substantially within a range of about 0.000 inches to about 0.003 inches, is provided between the bottom of said at least one protrusion and the opposing surface of the substrate.

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Claims 89 - 93 (Canceled)

94. (Currently Amended) The method according to claim 93 76, wherein said at least one protrusion comprises an adjustable spar, a screw or a set-screw.

95. (Currently Amended) The method according to claim 93 76, further comprising rotating said at least one protrusion to be threaded through said cap to adjust a distance of a bottom of said protrusion from a top surface of said substrate.

96. (Currently Amended) The method according to claim 93 76, wherein said at least one protrusion comprises a rivet for being adjustably inserted through said cap.

97. (Currently Amended) The method according to claim 93 76, wherein said at least one protrusion comprises a threaded cylindrical object.

98. (Currently Amended) The method according to claim 93 76, further comprising adjustably fitting said at least one protrusion through said cap such that a bottom surface of said at least one protrusion is flush with a top surface of said substrate.

99. (Currently Amended) The method according to claim 93 76, wherein said at least one

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protrusion is adjustably fitted to form a predetermined gap between a tip of said at least one protrusion and said substrate.

100. (Currently Amended) The method according to claim ~~93~~ 76, wherein said at least one protrusion includes threads which are sealed to prevent leakage and retain the protrusion position.

101. (Currently Amended) The method according to claim ~~93~~ 76, wherein an interposing layer of curable or hardened material is interposed between said at least one protrusion and said substrate.

102. (Original) The method according to claim 101, wherein said curable or hardened material comprises epoxy.

103. (Original) The method according to claim 76, further comprising:
forming a contact plate formed on said substrate for spreading a reaction load between said at least one protrusion and said substrate.

104. (Original) The method according to claim 103, wherein said contact plate comprises steel or another material having a hardness substantially the same as steel.

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105. (Original) The method according to claim 103, wherein said contact plate comprises a cylindrical plate or column.
106. (Original) The method according to claim 103, wherein said contact plate is attached to said substrate.
107. (Original) The method according to claim 103, wherein said contact plate is pre-attached to a tip of said at least one protrusion.
108. (Original) The method according to claim 107, wherein said contact plate is gimbaled or otherwise includes a movable contact surface which self-registers against the substrate or an opposite contact surface.
109. (Original) The method according to claim 103, wherein said contact plate protects a surface of said substrate from scratching damage.
110. (Original) The method according to claim 103, wherein said contact plate protects said substrate from excessive surface pressure.
111. (Original) The method according to claim 103, wherein said contact plate is retained and

located with a counterbore in said substrate.

112. (Original) The method according to claim 103, wherein said contact plate includes at least one rounded contact surface for centered contact to said at least one protrusion.

113. (New) A method of forming a land grid assembly (LGA) module, said method comprising:

preparing a cap including sealing legs respectively extending from peripheral ends of a first surface of said cap, and at least one integrally formed protrusion on said first surface of said cap intermediate said sealing legs; and

joining a substrate to said sealing legs to form a sealed module, said at least one protrusion extending to a predetermined distance above a surface of the substrate when the module is sealed,

and

selectively adjusting a position of said at least one protrusion in relation to said substrate, wherein during a load condition on said substrate, said at least one protrusion suppresses an amount of flexing of said substrate.